IONIC LIQUIDS FOR CO_2 AND CH_4 SEPARATION

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Abstract:

A class of neoteric organic solvents has gained an unprecedented bursting of interest, both by academia and industrial medium, in recent years. Ionic liquids (ILs) large organic cations and asymmetrical organic or inorganic anions compel these molecules to remain liquid at or near room temperature, while presenting, among others properties, negligible vapor pressures, high thermal stability, large liquidus range, nonflammability and high solvation capacity. The tunable properties of ILs, through an endless combination of cations and anions, allow the design of solvents for the development of more efficient and sustainable processes and products.

Nonetheless, and despite of the promising properties of ILs, further research is still required in order to make them solvents feasible candidates for real applications. Being a key parameter in the design of equilibrium stage– and rate–based separations, reliable gas solubility data is of most interest and a fundamental step towards the development of industrial applications, either by the data itself or by developing predictive and simulation tools to aid in the development of such applications.

Using a high pressure cell, previously used for extensive studies of CO2 solubilities, VLE isotherms up to 363 K and pressures up to 100 MPa were measured for mixtures of CO2 or CH4 with several aprotic and protic ionic liquids. A comparison and evaluation of basic, fluorinated and protic ILs in a wide range of pressures and temperatures, aiming at a better understanding of the mechanisms of solvation of CO2 and CH4, was performed.

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